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### (54) Flooring system

(57) The present invention relates to a flooring system comprising: a first flooring member (10) which has a first top surface (12) and a first engagement portion; a second flooring member (10') with a second top surface (12') which is essentially parallel to the first top surface (12), and a second engagement portion; the first engagement portion defining an elongated recess (70) with a locking cavity (80) which extends from said recess, the locking cavity (80) having a first inclined surface (82) which is inclined at an angle (C) relative to the first top surface (12); the second engagement portion

defining an elongated tongue (40') with a locking projection (50') which extends from said tongue (40'), the locking projection (50') having a first inclined surface (52') which is inclined at an angle (A) relative to the second top surface (12') and which is characterised in that the angle (A) is larger than the angle (C), whereby the first inclined surface (52') cooperates with the first inclined surface (82) to position the first flooring member (10) and the second flooring member (10') such that the first top surface (12) and the second top surface (12') are positioned in the same plane.

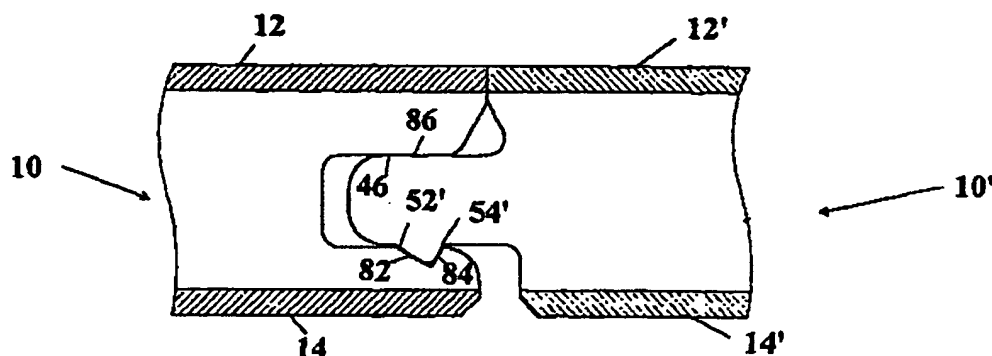


Fig. 6

## Description

### Field of the Invention

[0001] The invention generally relates to flooring panels. More specifically, the invention is directed to flooring panels which are maintained in position relative to each other by the use of tongue and groove technology.

### Prior Art

[0002] Various flooring systems are known from prior art whereby a panel fits into an adjacent panel. Of the known systems and the systems which are in some way close to the system of the present system, we wish to mention those of patents EP0813641 and EP 843763.

[0003] Patent EP 813641 relates to a floor or wall panel and the use thereof in a humid compartment. The panel is equipped with locking means in the form of a groove and a tongue which form a union between the groove and the tongue suitable for fitting the panels together. The groove and the tongue are made of a waterproof material and they are formed with an quick engagement coupling element, which is under pressure and has the effect of a spring.

[0004] Patent EP 843763 relates to a floor covering consisting of wooden floor panels, said hard floor panels having, at least along the edges of two opposite sides, coupling parts which are formed in such a way as to constitute a single part together with said wooden central component, and they cooperate with each other, substantially in the form of a tongue and a groove. It is essentially characterised in that the coupling elements are fitted with mechanical locking means which prevent the two flooring panels from moving apart in a direction perpendicular to the associated edges and parallel to the lower side of said coupled panels.

[0005] However, these patents have characteristics which are different from the subject-matter of this application as claimed in the characterising part of claim 1.

### Summary of the invention

[0006] The invention is directed to a flooring system made of flooring panels. A first flooring panel or member has a first top surface and a first engagement portion. A second flooring member has a second top surface which is essentially parallel to the first top surface, and a second engagement portion. The first engagement portion can be an elongated tongue with a locking projection extending therefrom. The locking projection has a first inclined surface which is inclined at a first angle relative to the first top surface. The second engagement portion can be in the form of an elongated recess with a locking cavity extending therefrom. The locking cavity has a second inclined surface which is inclined at a second angle relative to the first top surface. The second angle is larger than the first angle. Whereby, as the first

and second members are moved into engagement, the first inclined surface cooperates with the second inclined surface to position the first flooring member and the second flooring member such that the first top surface and the second top surface are positioned in the same plane.

[0007] Many advantages are provided by the flooring panels and system of the present invention. The configuration of the flooring panels insures that the top or upper surfaces of the panels will be positioned in the same plane, adding significantly to the aesthetic and functional nature of the floor. Also the cooperation of the panels insures that the panels will fit together properly and prevents the separation of the panels from each other, thereby eliminating inappropriate spaces between panels.

[0008] In the present invention, the cost of tooling to produce the flooring panels is minimised. As the panels do not have to be as precisely controlled as the prior art panels, the tooling does not need to be reconditioned as often, thereby eliminating costly downtime for the tooling.

[0009] As the panels are moved together, a positive retention force is exhibited between the panels. This positive retention provides sufficient force to retain the flooring panels together, with or without the use of a glue or adhesive. Consequently, the invention can be used with or without glue.

### Brief Description of the Drawings

[0010] The present invention will be more fully understood by reference to the following drawing figures wherein:

FIGURE 1 is an overview illustrating a portion of the installation of a flooring panel in a flooring system according to the present invention;

FIGURE 2 is a second overview illustrating another portion of the installation of a flooring panel in a flooring system according to the present invention; FIGURE 3 is a partial perspective of several flooring panels installed on a subfloor;

FIGURE 4 is a cross-sectional view of a flooring panel prior to installation;

FIGURE 5 is a partial cross-sectional view of two flooring panels prior to being mated together, and FIGURE 6 is a partial cross-sectional view of the flooring panels of Figure 5 after they are mated together.

### Detailed Description

[0011] Figure 1 illustrates a flooring system according to the invention. Each flooring panel 10 has a first major surface 12 and an oppositely facing second major surface 14. Side surfaces 16, 18 and end surfaces 20, 22 extend between the major surface 12 and 14. Although

the flooring panels 10 are shown as rectangular, other types of configurations are possible. The first major surface 12 has a laminate or thin layer 24 of decorative wood provided thereon and is designed to face away from the subfloor, as shown in Figure 1. The core 26 of each flooring panel 10 is made from material which has the strength, absorption, and other characteristics required. As the core will not be exposed once the flooring system is completely installed, the core 26 must not be as physically appealing as the layer 24.

[0012] As best shown in Figure 4, side surface 16 has a laminate portion 30 which extends from the first major surface 12 in a direction essentially perpendicular to the first major surface. A raduised portion 32 is provided proximate the laminate portion 30. The raduised portion extends inward toward side surface 18 from the plan of laminate portion 30. A tongue 40 extends from side surface 16 outward in a direction away from side surface 18. The tongue is positioned below the raduised portion 32 when viewed in Figure 4. A bottom straight portion 34 and bottom angled position 36 also are provided on the side surface 16. The portions 34 and 36 are offset toward side surface 16 from the plan of laminate portion 30.

[0013] As best shown in Figures 4 through 6, tongue 40 has a fixed end 42 attached to side surface 16 and a free end 44 which has a rounded or arcuate configuration. An upper surface 46 and a lower surface 48 extend between the free end and the fixed end. In the embodiment shown, the planes of the upper and lower surfaces are essentially parallel to the plan of the first major surface 12. A projection 50 extends from the lower surface 48. The projection has a first inclined surface 52 and a second inclined surface 54. The first inclined surface 52 is inclined at an angle A from a line which is perpendicular to the plane of the first major surface 12. The second inclined surface 54 is inclined at an angle B from a line which is perpendicular to the plane of the first major surface 12. In the embodiment shown, the angle A is 70° and the angle B is 45°. However, the angles can be varied and still fall within the scope of the invention.

[0014] Side surface 18 has a laminate portion 60 which extends from the first major surface 12 in a direction essentially perpendicular to the first major surface and essentially parallel to the laminate portion 30. A lead-in portion 62 is provided proximate laminate portion 60. The lead-in portion 62 slopes inward toward side surface 18. A recess 70 extends from side surface 18 inward in a direction toward side surface 16. The recess 70 is provided below the lead-in portion 62 when viewed in Figure 4. A raduised portion 64 and bottom angled portion 66 are provided on the side surface 18. The portions 64 and 66 are offset toward side surface 16 from the plane of laminate portion 60.

[0015] Recess 70 has open end 72 and a closed end 74. An upper surface 76 and a lower surface 78 extend between the open end and closed end. In the embodi-

ment shown, the planes of the upper and lower surfaces 76, 78 are essentially parallel to the plane of the first major surface 12. The space X between the upper surface 76 and lower surface 78 is dimensioned to be larger than the dimension Y between the upper surface 46 and lower surface 48 of the tongue 40. A channel 80 is provided in the lower surface 78 and extends from the lower surface in a direction toward the second major surface 14. The channel 80 has a first inclined surface 82 and a second inclined surface 84. The first inclined surface 82 is inclined at an angle C from a line which is perpendicular to the plane of the first major surface 12. The second inclined surface 84 is inclined at an angle D from a line which is perpendicular to the plane of the first major surface 12. In the embodiment shown, the angle C is 65° and the angle D is 45°. However, the angles can be varied and still fall within the scope of the invention.

[0016] Referring to Figure 1, individual flooring panels 10 are joined together to form a flooring system. During installation, various individual flooring panels 10 are positioned on the subfloor and manipulated into engagement with other flooring panels 10'. This process is best illustrated in Figures 1 and 2. As best shown in Figure 1, a respective flooring panel 10 is laid on subfloor 90, such that the second major surface 14 is in contact with and essentially parallel to the subfloor 90. The flooring panel 10 is moved in the direction of the arrows until such time when the tongue 40' of flooring panel 10' engages a portion of recess 70 of flooring panel 10. (The use of the prime symbol is for ease of explanation; parts designated by a prime are identical to parts which are identified with the same number and no prime.) Referring to Figures 5 and 6, this movement continues until raduised portion 64 engages projection 50'. The engagement of projection 50' and raduised portion 64 is assured even if the respective flooring panels are slightly misaligned. As tongue 40' has a free end 44' which has an accurate or rounded configuration and as side surface 18 has a lead-in portion 62 and a raduised portion 64, the cooperation of end 44' and portions 62 and 64 will cause the recess 70 to be moved into alignment with the tongue 40' as mating occurs. As the dimension M of tongue 40' is greater than the dimension N of recess 70, an increased force is required to continue the mating of flooring panel 10 with flooring panel 10'. As shown in Figure 1, this increased force is supplied by the installer using a hammer and a block. The installer will supply the appropriate force to the opposite side 16 of the flooring panel 10 to cause the raduised portion 64 to move beyond the projection 50' of the tongue 40 and into cooperation with channel 80 of recess 70. As this movement occurs, the portions of flooring panel 10 which are above and below recess 70 resiliently deform to allow the tongue 40' and projection 50' to move accordingly. The force applied to side 16 must be sufficient to resiliently deform flooring panel 10 while not causing damage to side 16 or tongue 40 extending therefrom.

[0017] Referring to Figures 5 and 6, as flooring panel

10 is moved into engagement with flooring panel 10', channel 80 cooperates with projection 50'. As best shown in Figure 6, the first inclined surface 52' of projection 50' cooperates with the first inclined surface 82 of channel 80 and the second inclined surface 54' of projection 50' either cooperates with or is in close proximity to second inclined surface 84 of channel 80.

[0018] The cooperation of first inclined surface 52' and first inclined surface 82 performs an important function with respect to the proper installation of the flooring system. In order for the flooring system to be both aesthetically pleasing and function properly, the first major surfaces 12 of each flooring panel must be aligned and must be in the same plane. Even slight variances in the positioning of the first major surfaces can cause the floor to be unattractive and unsafe. Therefore, it is important to provide the flooring panels with a mechanism to insure that the first major surfaces will be coplanar.

[0019] In order to insure coplanarity, the interaction between first inclined surface 52' and the first inclined surface 82 is critical. According to the present invention, first inclined surface 52' extends at an angle A from a line perpendicular to the first major surface and the first inclined surface 82 extends at an angle C from a line perpendicular to the first major surface. As angle A is 70° and angle C is 65°, the slope of surface 82 is steeper than the slope of surface 52'. Therefore, as flooring panel 10 and flooring 10' are moved together, surface 52' will engage surface 82. The continued installation of flooring panels causes 52' to be biased upward. As installation is complete, surface 52' is biased upward by surface 82 causing upper surface 46' of tongue 40' to engage upper surface 76 of recess 70. The positioning of upper surface 46' is accurately controlled relative to the first major surface 12' as the flooring panel 10' is manufactured. Likewise, the upper surface 76 is accurately controlled relative to the first major surface 12 as the flooring panel 10 is manufactured. Consequently, the dimensioning of the flooring panels insures that when surfaces 46' and 76 are provided in engagement, the first major surface 12 will be positioned in the same plane as any other respective first major surface 12'. Therefore, with tongue 40' positioned in recess 70 as described, the coplanarity of the first major surface 12 with first major surface 12' is assured.

[0020] It is important to note that while the angles described with respect to the preferred embodiment have certain defined values, the scope of the invention is not limited to those specific values. Rather the invention is accomplished if angle A is greater than angle C, thereby causing surface 82 to have a steeper slope than surface 52'.

[0021] With respect to angle B and D, these angles are identical in the embodiment shown. This insures that surfaces 54' and 84 are essentially parallel to each other. This type of configuration helps to hold surfaces 52' and 82 in position relative to each other. The cooperation of surfaces 54' and 84 helps to maintain surfaces

52' and 82 in engagement, thereby facilitating the coplanarity of surfaces 12 and 12'. The cooperation of surfaces 54' and 84 also prevents the separation of panel 10 from panel 10'. However, the dimensions of angles B and D are not as important as the dimensions of A and C. In fact, in order for the flooring panels to be properly positioned, it is not essential that surfaces 52' and 82 be coplanar.

[0022] Referring to Figure 2, once the sides of the flooring panels have been joined, the ends are joined in essentially the same manner, and therefore, a detailed description of the joining of the ends will not be addressed in detail, as it would be repetitive of the operation previously described.

[0023] In the embodiment described above, the tongue 40' extends from flooring panel 10' and the recess 70 is provided in flooring panel 10. However, the invention operates in the same manner if the recess 70' is provided in the flooring panel 10' and the tongue 40 extends from flooring panel 10.

[0024] Many advantages are provided by the flooring panels 10 and system described herein. As previously stated, the configuration of the flooring panels insures that the upper surfaces 12 of the panels will be positioned in the same plane, adding significantly to the aesthetic and functional nature of the floor. Also, the cooperation of the projection 50 with channel 80 prevents the separation of the panels. If the panels are permitted to separate, the aesthetics of the flooring system is degraded. Separation of the panels can also cause safety and maintenance issues.

[0025] Due to the fact that the angles do not have to be precisely controlled (i.e. angle A must be greater than angle C, but the exact measurement of the angles can vary), the cost of tooling to produce the flooring panels is minimized. As the exact angles must not be cut with extreme precision, the tooling does not need to be reconditioned as often, thereby eliminating costly downtime for the tooling.

[0026] The configuration of the sides and ends of the flooring panels also helps insure that the flooring panels will fit together properly. Other than the tongues and recesses, the only other portions of the flooring panels which engage are the portions 30 and 60 which are proximate the surface 12. As no other portions engage, the other portions will not prevent the surfaces 12 of panels from being held in the proper spaced relationship.

[0027] As the panels are moved together, the portions of the panels resiliently deform, causing the tongue to effectively click in place in the recess. This positive retention of the tongue in the recess provides sufficient force to retain the flooring panels together, with or without the use of a glue or adhesive. Consequently, the invention can be used with or without glue.

[0028] The foregoing illustrates just some possibilities for practicing the invention. Many other embodiments are possible within the scope of the invention. It is, therefore, intended that the foregoing description be regard-

ed as illustrative rather than limiting, and that the scope of the invention is given by the appended claims together with their full range of equivalents.

## Claims

### 1. A flooring system comprising:

a first flooring member (10) having a first top surface (12) and a first engagement portion;  
 a second flooring member (10') having a second top surface (12) which is essentially parallel to the first top surface (12), and a second engagement portion;  
 the first engagement portion defining an elongated recess (70) with a locking cavity (80) extending from said recess, the locking cavity (80) having a first inclined surface (82) which is inclined at an angle (C) relative to the first top surface (12);  
 the second engagement portion defining an elongated tongue (40') with a locking projection (50') extending from said tongue (40'), the locking projection (50') having a first inclined surface (52') which is inclined at an angle (A) relative to the second top surface (12');  
 characterised in that the angle (A) is larger than the angle (C), whereby the first inclined surface (52') cooperates with the first inclined surface (82) to position the first flooring member (10) and the second flooring member (10') such that the first top surface (12) and the second top surface (12') are positioned in the same plane, the locking being carried out by resting the surfaces 54' and 84 of the locking projection 50' and the locking cavity 80 respectively against each other.

2. A flooring system according to claim 1, characterised in that the coplanarity between the main surfaces 12 and 12' is guaranteed by interaction between the first inclined surface 52' and the first inclined surface 82 due to the fact that the angle A is greater than the angle C, meaning that the flooring panel 10 and the flooring panel 10' move towards each other, the surface 52' coming into contact with the surface 82 and the surface 52' being pushed upwards by the surface 82, which causes the upper surface 48' of the tongue 40' to come into contact with the upper surface 76 of the recess 70.

3. A flooring system according to the previous claims, characterised in that an upper surface 48 and a lower surface 48 extend between the free end 44 and the fixed end 42 of the tongue 40, said surfaces being parallel to the plane of the first major surface 12, and in that an upper surface 78 and a lower

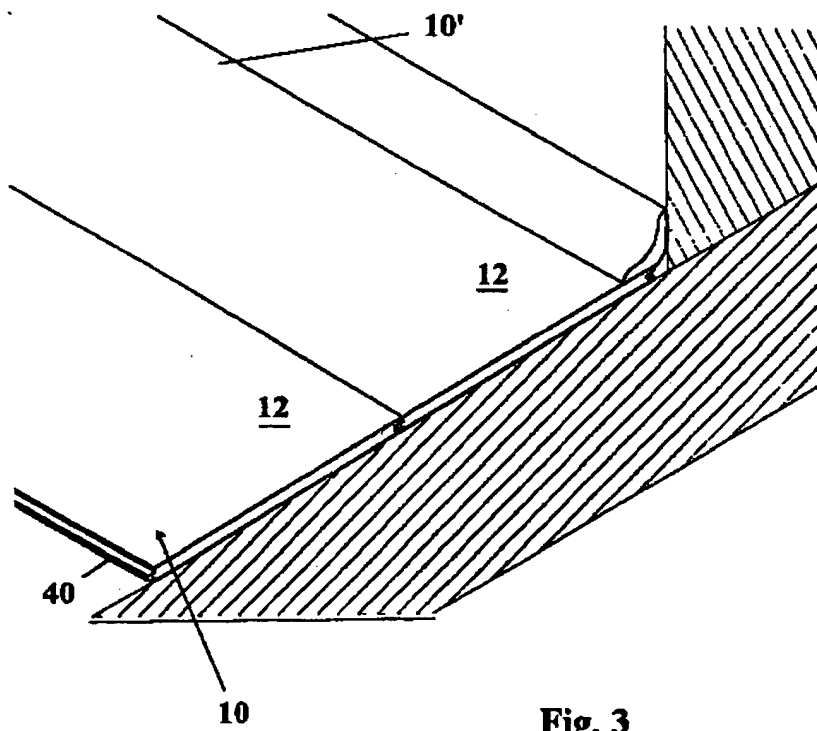
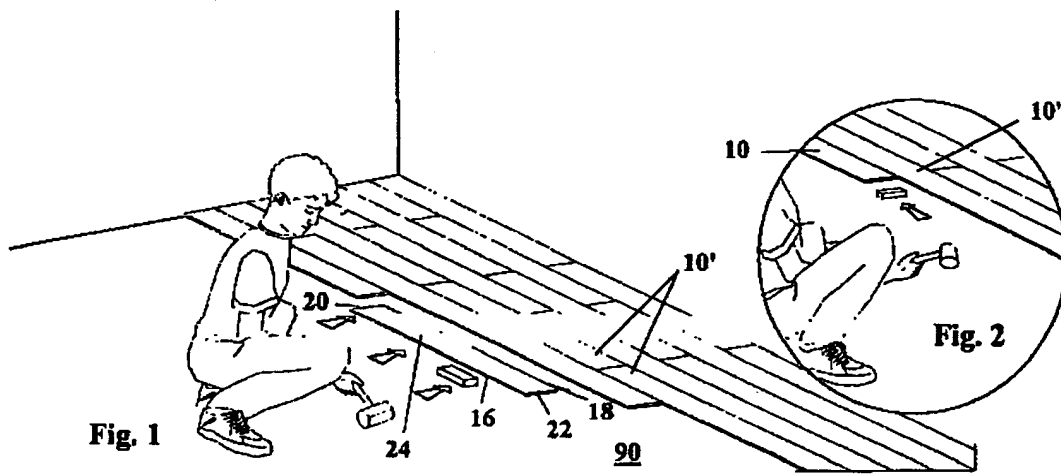
surface 78 extend between the open end 72 and the closed end 74 of the recess 70, said surfaces being essentially parallel to the plane of the first major surface 12.

4. A flooring system according to the previous claims, characterised in that the lead-in portion 62 and the portion 64 of the side surface 18 have a rounded configuration in order to facilitate the centring and the guiding of the tongue 40 in the recess 70.

5. A flooring system according to the previous claims, characterised in that, after assembly, a free space remains between the free end 44 of the tongue 40 and the closed end 74 of the recess 70, which space allows glue to be applied between the two surfaces in order to insure permanent engagement between two adjacent panels.

6. A flooring system according to the previous claims, characterised in that the design of the side surfaces 16 and 18 of the tongue 40 and the recess 70 respectively allow a significant amount of material to be saved during manufacture.

7. A flooring system according to the previous claims, characterised in that the angles A and C between the inclined surface 52' and the vertical and the inclined surface 82 and the vertical respectively follow the format  $A > C$  and do not need to be strictly controlled. Their exact value can vary, which helps to extend the life of the cutting tools and consequently reduces costs.



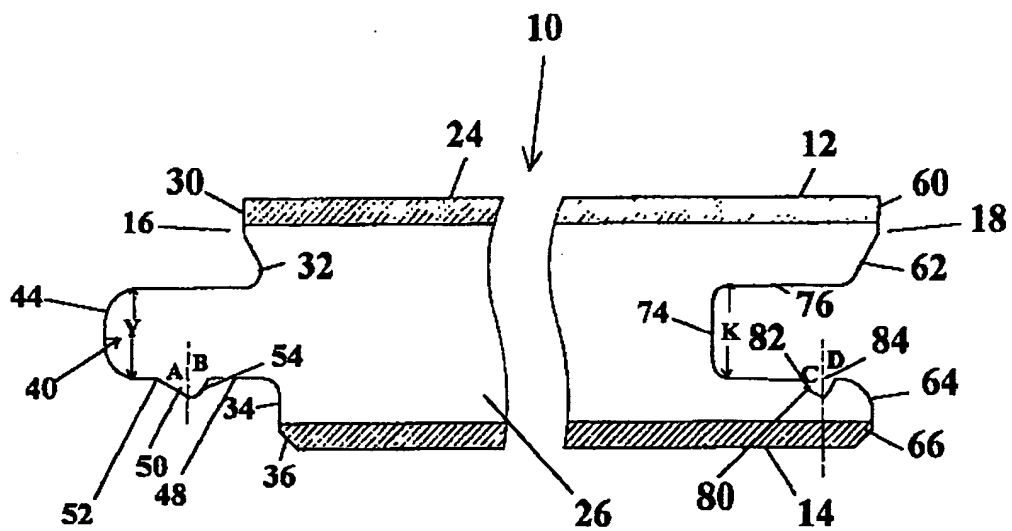


Fig. 4

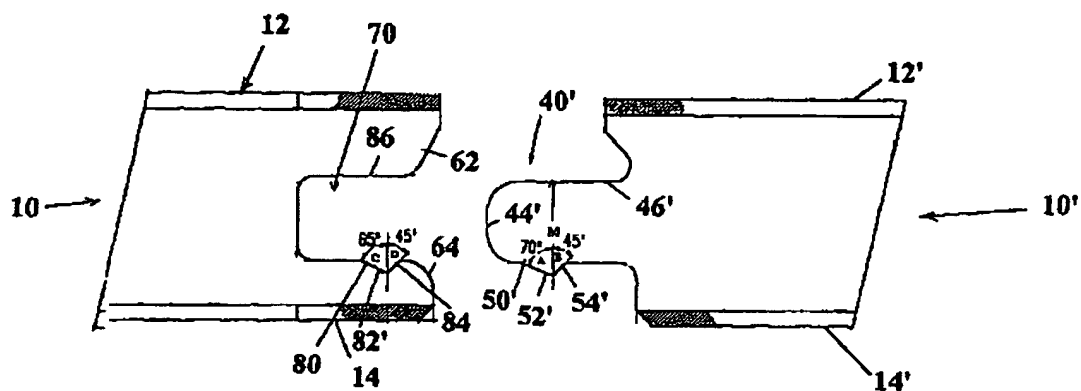


Fig. 5

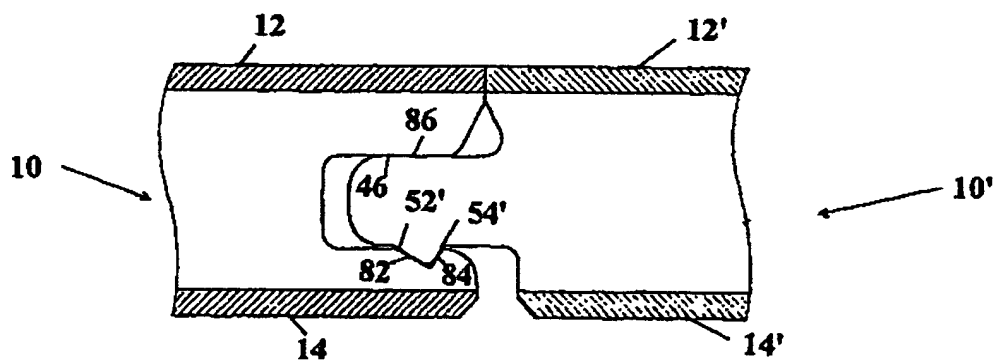


Fig. 6





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# EUROPEAN SEARCH REPORT

Application Number  
EP 00 67 0011

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	DE 200 02 413 U (HAMBERGER INDUSTRIEWERKE GMBH) 27 Apr11 2000 (2000-04-27) * page 6, line 21 - page 12, line 30; figures 1-3 *	1-7	E04F15/04
A	FR 2 785 633 A (ROY VALERIE) 12 May 2000 (2000-05-12) * page 4, line 29 - page 10, line 36; figures 1-7 *	1-7	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			E04F
The present search report has been drawn up for all claims			
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>8 May 2001</b>	Examiner <b>Ayiter, J</b>
<p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons &amp; : member of the same patent family, corresponding document</p>			

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 00 67 0011

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
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08-05-2001

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 20002413 U	27-04-2000	NONE	
FR 2785633 A	12-05-2000	AU 1165300 A	29-05-2000
		WO 0028171 A	18-05-2000